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Bureau of Land Management

Visual Resource Management

Visual Resource Management Program



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Department of the Interior
Bureau of Land Management
Division of Recreation and Cultural Resources
18th and C Streets, N.W.
Washington, D.C. 20240
202-343-9353

BLM *Division of Recreation and Cultural Resources, Washington, D.C.*

Contractor *Patrice Braverman Graphics; Patrice Braverman, Project Manager and Reviewer; Stephen Sheppard, Simulations Consultant and Illustrator; Joslyn Green, Editor*

Sub-Contractor *Hanlon Design Group; Gary Hanlon, Designer; Gary Hanlon and Lori Hight, Illustrators.*

Consultant *Gage Davis Associates, Inc.; Jeff Winston, Technical Editor*

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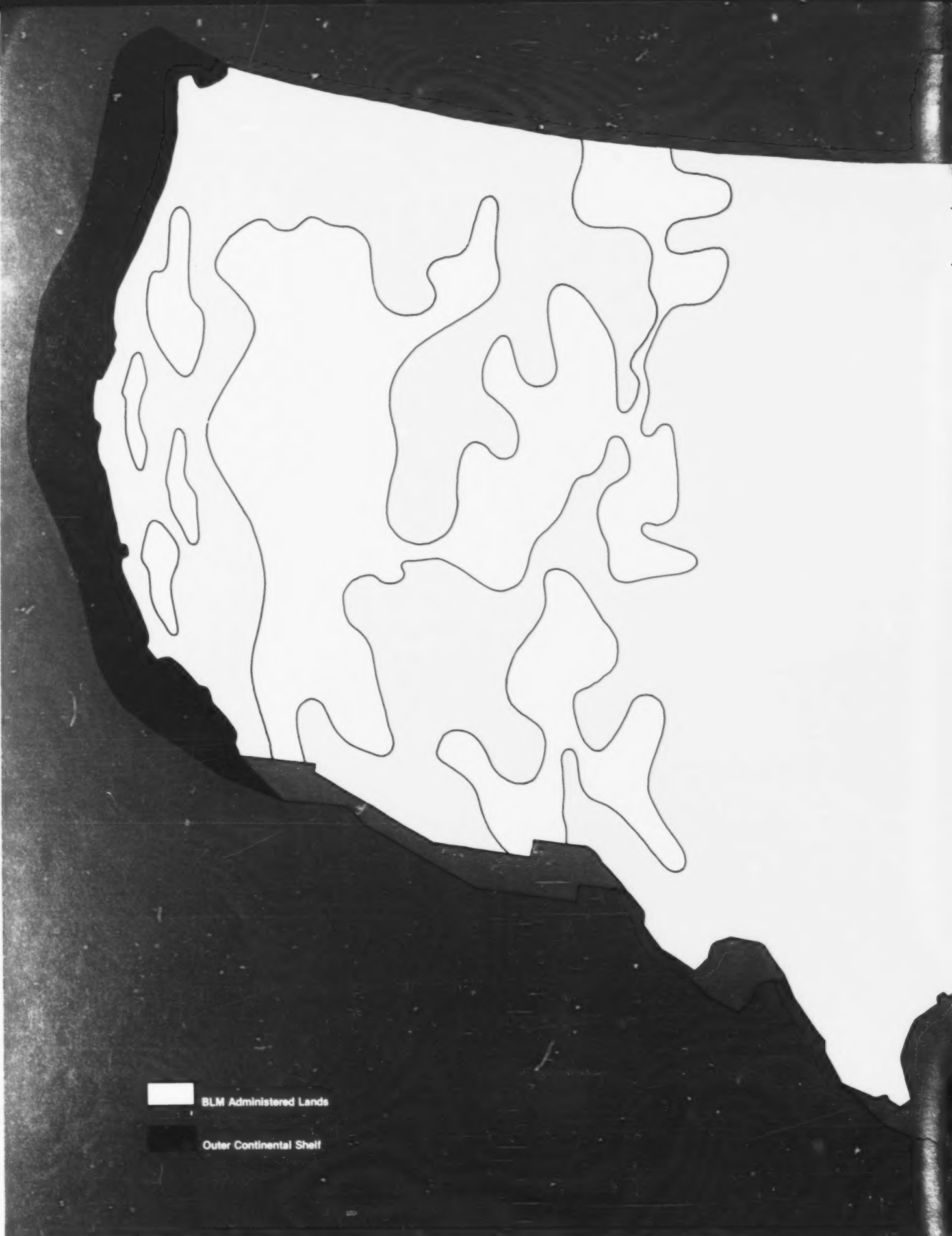
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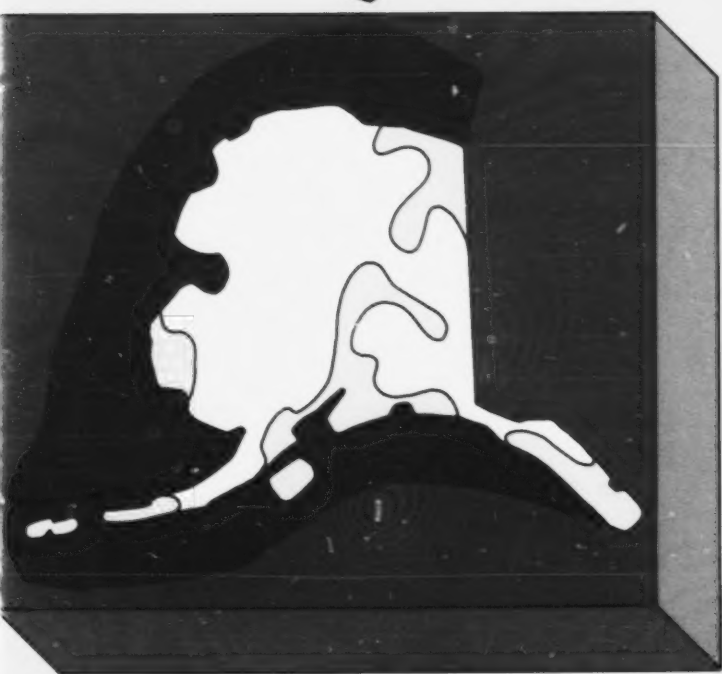


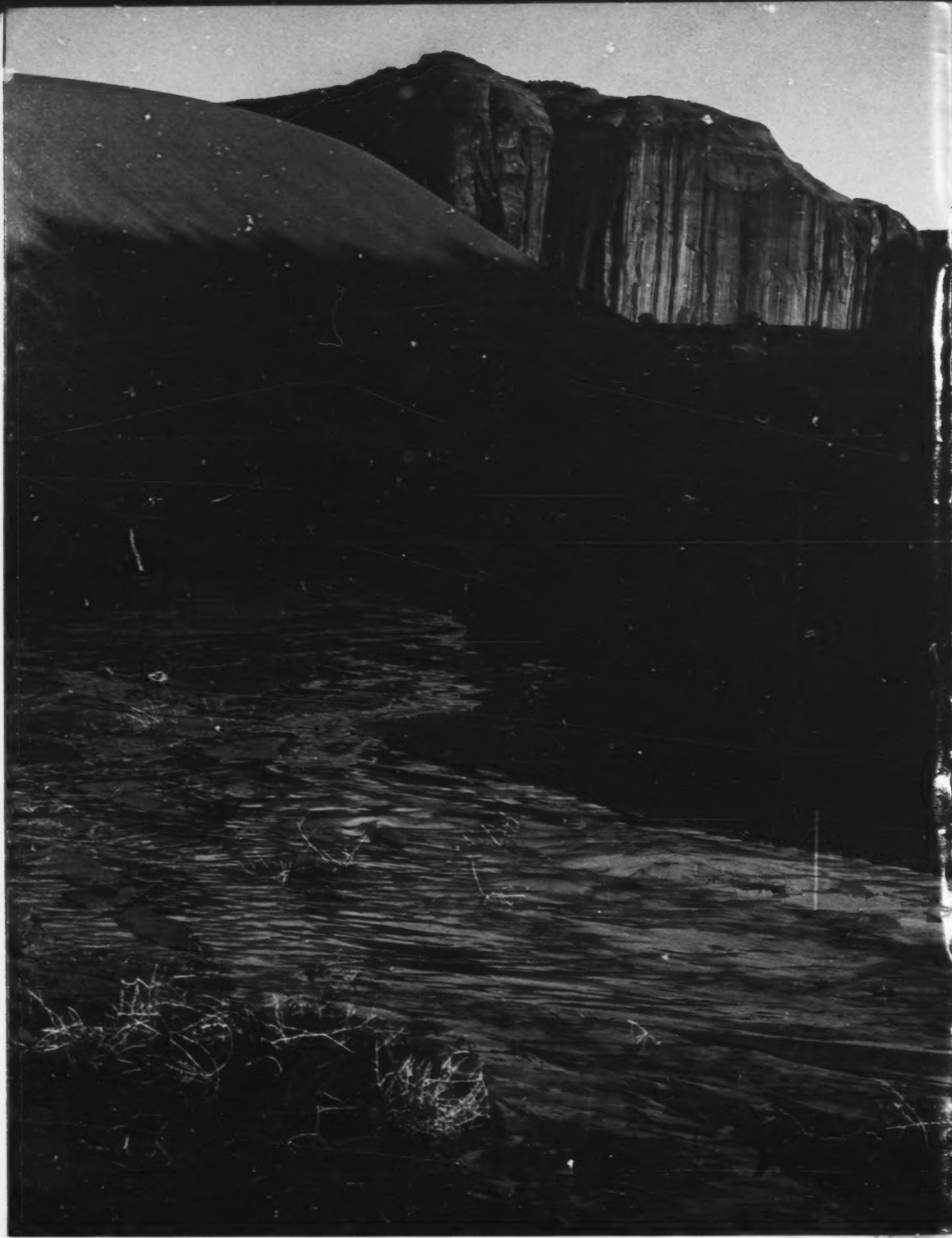
BLM Administered Lands



Outer Continental Shelf







Perspective

The quality of the visual environment has become increasingly important to the American public. The Bureau of Land Management is committed to managing visual resources on an equal basis with all other resources as it continues to put public land to productive use.

Visual Resource Management (VRM) has dual program purposes: to manage the quality of the visual environment, and to reduce the visual impact of development activities, while maintaining effectiveness in all Bureau resource programs. VRM also identifies scenic areas that warrant protection through special management attention. It is a specific process that can be mapped and incorporated into design planning for projects ranging from siting transmission lines to harvesting timber.

This publication is an introduction to the VRM program. Its intended use is to familiarize decision makers, land use planners, and designers both inside and outside of the Bureau with VRM and its benefits.

New Directions

Managing the visual aspects of changes to the natural landscape is particularly important for the Bureau of Land Management because most activities taking place on Bureau lands involve some degree of alteration. The Bureau's responsibilities for visual management are spelled out in key passages of recent Federal legislation.

The Federal Land Policy and Management Act of 1976 (FLPMA), often referred to as the "organic" act for the Bureau, requires that:

public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use, . . .

The act also states that the Secretary of the Interior shall:

prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values (including but not limited to outdoor recreation and scenic values).

The Act, for the first time, places *scenic* resources on an equal basis with other resources. It also makes inventorying and managing scenic and other environmental values an explicit criterion that must be applied throughout the land management activities of the Bureau.

This same law also places new emphasis on the role of land use planning by requiring that resource management plans:

give priority to the designation and protection of areas of critical environmental concern. The



criteria for identifying these areas are stated in the definition section: "... areas ... where special management attention is required ... to protect and prevent irreparable damage to important historical, cultural, or scenic values, fish and wildlife resources or other natural systems or processes or to protect life and safety from natural hazards."

The National Environmental Policy Act of 1969 (NEPA), an earlier and very important piece of environmental legislation, states that it is the Federal Government's responsibility to:

assure for all Americans safe, healthy, productive, and aesthetically and culturally pleasing surroundings.

The Act further says that:

all agencies of the Federal Government shall ... identify and develop methods and procedures ... which will insure that presently unquantified environmental amenities and

values may be given appropriate consideration in decision-making along with economic and technical considerations.

It also requires:

a systematic and interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decision-making which may have an impact on man's environment.

Significant aspects of these Federal laws are their increased emphasis on environmental and scenic values and their requirement that the long-term and short-term consequences of all resource commitments receive equal consideration.



The Bureau and Land Management

America's public lands and their resources have always been a public trust, but the management role of the Federal Government has changed with the times. After creation of the "Public Domain," when lands west of the Allegheny Mountains were transferred to Federal administration early in the nineteenth century, the government assumed responsibility for the protection and use of public lands. Hundreds of laws and grants were subsequently enacted to transfer ownership of these lands to homesteaders and other private parties. In the mid-1930s, however, the emphasis changed. Since that time, concepts for controlled management of the remaining public land (about 20 percent of the land area of the United States) have gradually evolved.

Over time, a number of public agencies have been created to oversee and manage public lands. One of these, the Bureau of Land Management, was established in 1946 and given responsibility primarily for the large grazing lands of the West. That stewardship has been expanded until now the Bureau bears responsibility for the total management of over 400 million acres of public land in the Far West,

Alaska, and small areas scattered through the rest of the Nation. In addition, the Bureau manages an estimated 7 million acres of property on the Outer Continental Shelf. The Bureau's varied land management programs concern themselves with energy sources such as oil and gas, with timber, wildlife, and grazing activities, and with the cultural sites and recreation areas located on public land. In 1977, revenues from these lands and resources totalled more than \$3 billion. These funds were derived from mineral leasing, land and timber sales, and other license, fee, and permit programs administered by the Bureau.

By Congressional mandate, management of the resources of these varied lands for *multiple use* and *sustained yield* is a major part of the Bureau's responsibility. *Multiple use* involves balancing the development of diverse resources, both renewable and non-renewable. *Sustained yield* involves coordinating the management of these resources so that environmental quality and the productivity of the



land are not permanently impaired. Managing vast and varied resources under this mandate is a complex undertaking, particularly since the priorities set for one management activity often conflict with the priorities set for another.

The Bureau and Visual Resources

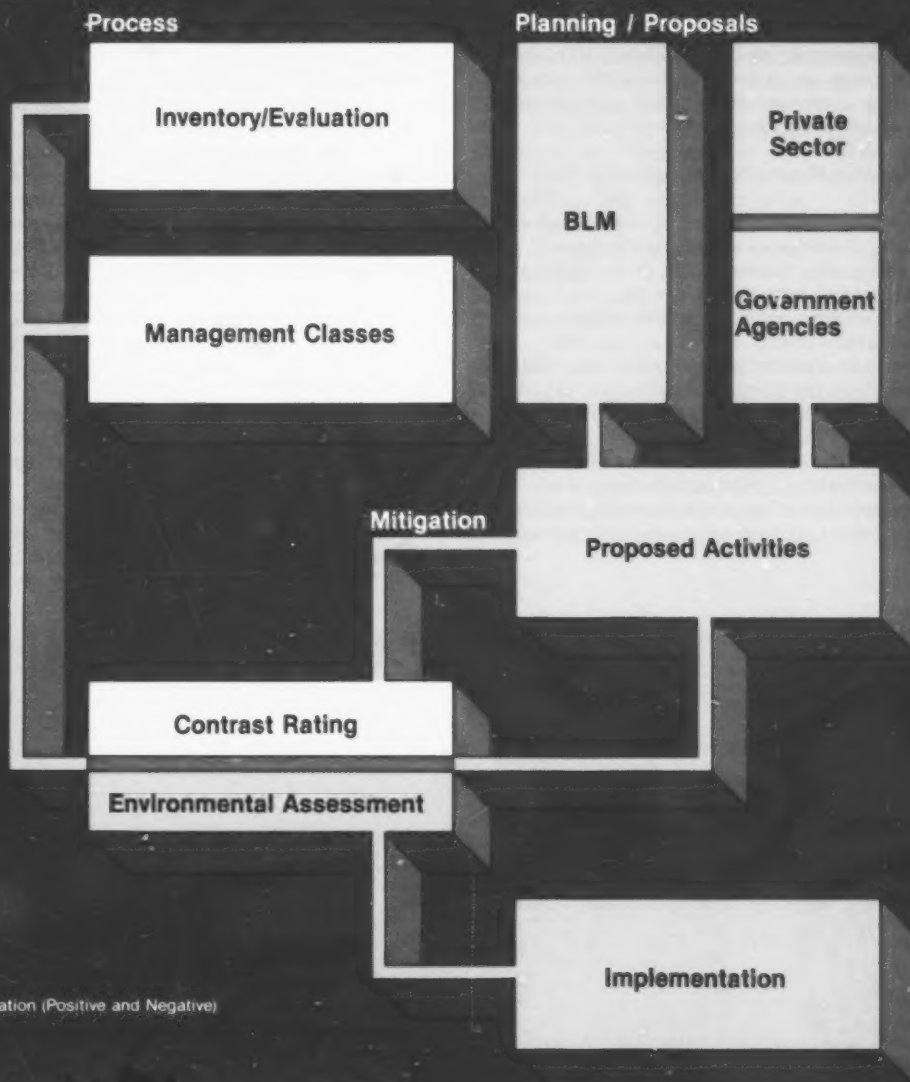
The Bureau of Land Management is concerned with managing visual resources equally with other resources and attaining acceptable levels of visual impact without unduly reducing commodity production or limiting overall program effectiveness. It is therefore Bureau policy that visual resource considerations be included in environmental assessments, in land use planning decisions, and in the implementation of resource projects.

Since it was put into effect in 1975, the VRM program has helped set standards for transmission line location, timber harvesting, recreation development, range management, mining activities, and highway placement.

Because the scenic value and management objectives of public lands vary, it is not practical to provide a uniform level of visual management for all areas administered by the Bureau. The agency has therefore developed a system for evaluating the visual resources of a given area and for determining what degree of protection, rehabilitation, or enhancement is desirable and possible. This Bureau-wide system provides an inter-disciplinary approach to managing visual resources. The integration of VRM into the Bureau's procedures for planning and environmental analysis ensures maximum coordination between a proposed land use and the existing visual conditions.



System



Cultural Modification (Positive and Negative)

Concepts

The VRM system is an analytical process that identifies, sets, and meets objectives for maintaining scenic values and visual quality.

The system is based on research that has produced ways of assessing aesthetic qualities of the landscape in objective terms. What had been considered extremely subjective (aesthetic judgment, particularly concerning the landscape) was found to have identifiable, consistent qualities that can be described and measured. Whatever the terrain (and whoever the observer), perception of visual quality in a landscape seems to be based on several common principles:

- Landscape character is primarily determined by the four basic visual elements of *form, line, color, texture*. Although all four elements are present in every landscape, they exert varying degrees of influence.
- The stronger the influence exerted by these elements, the more interesting the landscape.
- The more visual variety in a landscape, the more aesthetically pleasing the landscape. Variety without harmony, however, is unattractive, particularly in terms of alterations (cultural modifications) that are made without care.

The Bureau incorporates these and other principles in its broad program for managing visual resources.

The VRM system functions in two ways.

First, for management purposes, the Bureau conducts an inventory that evaluates visual resources on all

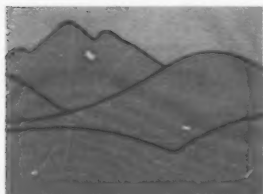
lands under its jurisdiction (**Inventory/Evaluation**). Once inventoried and analyzed, lands are given relative visual ratings (**Management Classification**). The development of Management Classes is not project-specific. It is a general process to identify broad visual objectives for all public lands.

Second, when development is proposed, by the Bureau itself (through its planning process), or by other agencies or the private sector, the degree of contrast between the proposed activity and the existing landscape is measured (**Contrast Rating**).

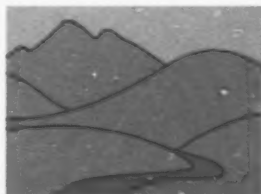
These combined steps constitute the VRM process, which has a number of applications. The process can help make the visual impact of proposed activities more acceptable while these activities are still in the design stage. Graphic simulations of proposed activities help illustrate the extent of potential visual impact. Modifications may be suggested. During project construction, monitoring assesses actual visual impact. In both instances, VRM plays a support role.

VRM also functions in close conjunction with two other key Bureau programs: **Land Use Planning**, which affects nearly every resource decision, and **Environmental Assessment**, which is required in proposals made for projects on BLM managed lands. The flexibility of VRM allows it to be easily incorporated into these current decision-making processes as well as into those that may be developed in the future.

Form



Line



Color



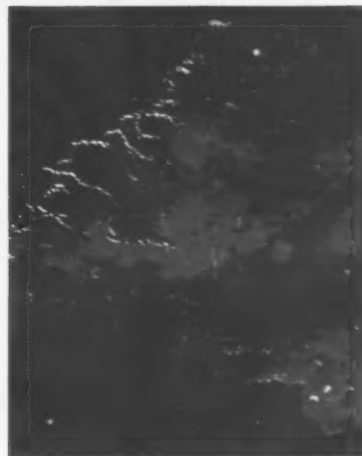
Texture



Proposed Site



Simulated Activity



Monitoring by Satellite Imagery



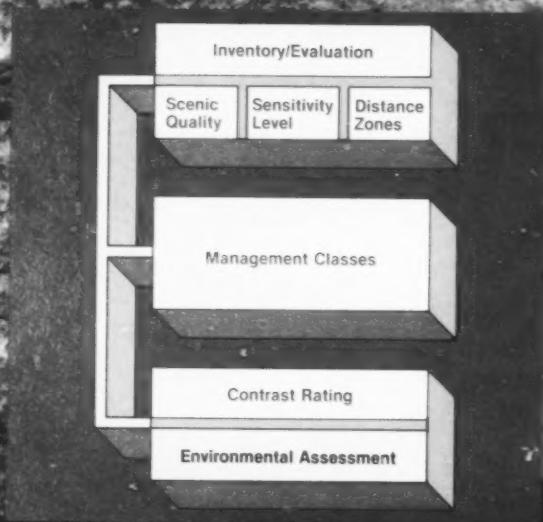
Terms

To understand how the Bureau of Land Management manages visual resources, it is important to understand how some key terms are used in the VRM system.

Many of the terms illustrated and briefly defined here are drawn directly from the visual arts. Others have been modified somewhat, given special meanings by their VRM context. All are basic—the “program language” of VRM.

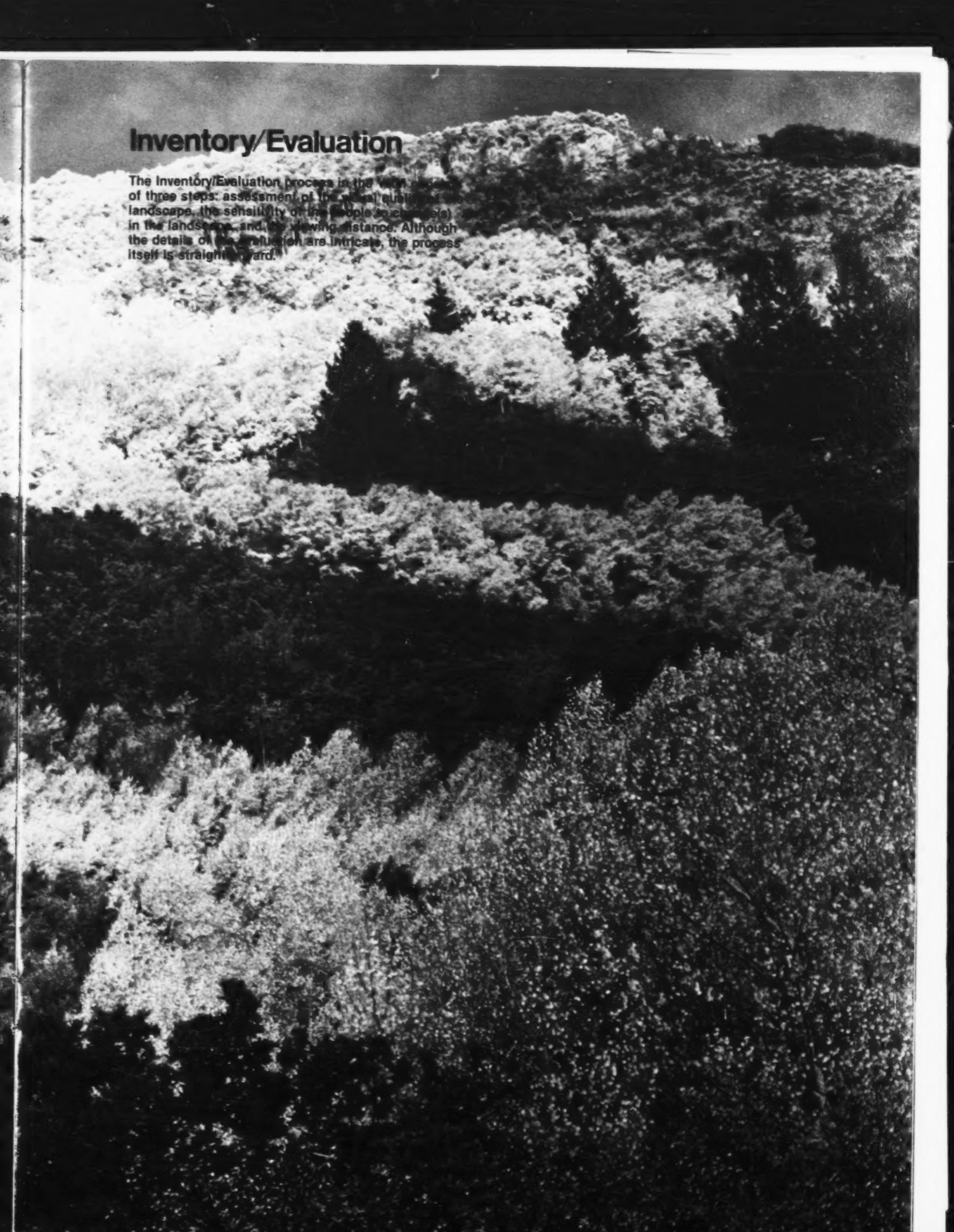
- 1 **Form** The mass or shape of an object, which appears unified; often defined by edge, outline, and surrounding space.
- 2 **Line** The path that the eye follows when perceiving abrupt differences in form, color, or texture. In the landscape, ridges, skylines, structures, changes in vegetation, or individual trees and branches may be perceived as line.
- 3 **Color** The property of reflecting light of a particular wavelength that enables the eye to differentiate otherwise indistinguishable objects.
- 4 **Texture** The visual manifestation of the interplay of light and shadow created by variations in the surface of an object.
- 5 **Harmony** The combination of parts into a pleasing or orderly whole; congruity; a state of agreement or proportionate arrangement of form, line, color, and texture.
- 6 **Variety** The condition of having differentiated parts; the absence of monotony or sameness.
- 7 **Contrast** The effect of a striking difference in form, line, color, or texture of a landscape's features.
- 8 **Cultural
Modification** Any man-made change in land, waterform or vegetation (roads, bridges, buildings, fences); the addition of a structure which creates a visual contrast to the natural character of a landscape. A *negative* cultural modification is disharmonious with the existing scenery. A *positive* cultural modification can actually complement and improve a particular scene by adding variety and harmony.
- 9 **Back
Lighting** The light source comes from behind the object viewed. The visible face of the object is generally in shadow and its edge highlighted.
- 10 **Front
Lighting** The light source comes from behind the observer and falls directly on the object viewed. There is little shadow effect.
- 11 **Side
Lighting** The light source comes from one side of the object viewed. This is the light considered most effective for evaluating visual contrast.

Process



Inventory/Evaluation

The Inventory/Evaluation process is the first step of three steps: assessment of the visual quality of the landscape, the sensitivity of the people to change(s) in the landscape, and the viewing distance. Although the details of the evaluation are intricate, the process itself is straightforward.



Scenic Quality

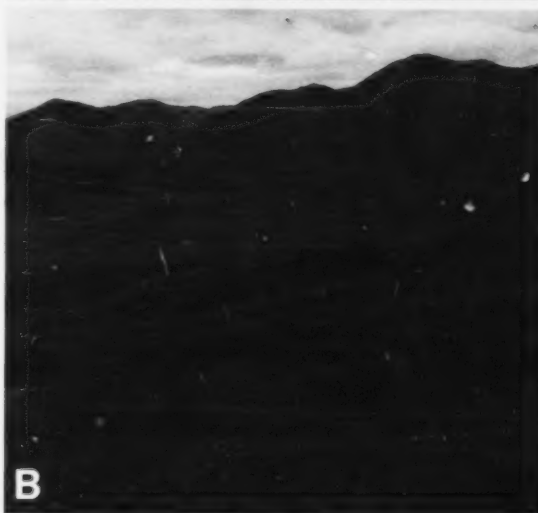
Scenic Quality is perhaps best described as the overall impression retained after driving through, walking through, or flying over an area of land. In the VRM process, rating Scenic Quality requires a brief description of the existing scenic values in a landscape. This step identifies (1) areas that must be protected, (2) opportunities for enhancement and rehabilitation, and (3) opportunities for improvement by reducing the contrast of cultural modifications.

When inventoried, an area is first divided into sub-units that appear homogeneous, generally in terms of landform and vegetation. Each area is then rated by seven Key Factors: *landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification*. A standardized point system assigns great, some, or little importance to each factor. The values for each category are calculated and, according to total points, three Scenic Quality Classes are determined and mapped:

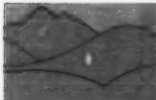
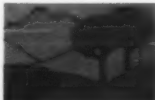
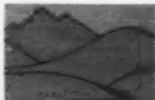
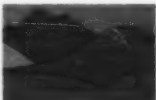
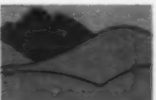
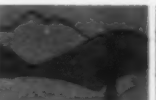
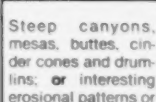
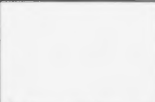
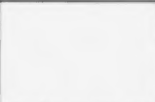
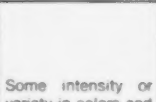
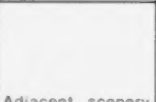
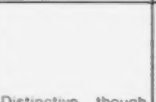
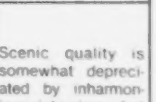
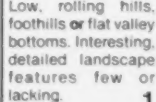
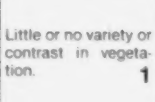
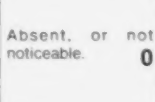
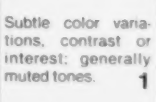
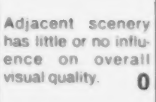
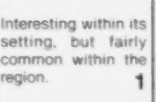
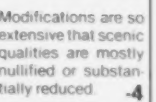
Class A Areas that combine the most outstanding characteristics of each rating factor (19-33 points).

Class B Areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region (12-18 points).

Class C Areas in which the features are fairly common to the physiographic region (0-11 points).



Scenic Quality Inventory/Evaluation Rating Criteria and Score

Landform	Vegetation	Water	Color	Adjacent Scenery	Scarcity	Cultural Modifications
						
High vertical relief such as prominent cliffs, spires or massive rock outcrops; or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. 5	A variety of vegetative types in interesting forms, textures, and patterns 5	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. 5	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. 5	Adjacent scenery greatly enhances visual quality. 5	One of a kind; or unusually memorable; or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing. 6	Free from esthetically undesirable or discordant sights and influences; or modifications add favorably to visual variety. 2
						
Steep canyons, mesas, buttes, cinder cones and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features present and interesting though not dominant or exceptional. 3	Some variety of vegetation, but only one or two types. 3	Flowing or still, but not dominant in the landscape. 3	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. 3	Adjacent scenery moderately enhances overall visual quality. 3	Distinctive, though somewhat similar to others within the region. 2	Scenic quality is somewhat depreciated by inharmonious intrusions, but not so extensively that they are entirely negated; or modifications add little or no visual variety to the area. 0
						
Low, rolling hills, foothills or flat valley bottoms. Interesting, detailed landscape features few or lacking. 1	Little or no variety or contrast in vegetation. 1	Absent, or not noticeable. 0	Subtle color variations, contrast or interest; generally muted tones. 1	Adjacent scenery has little or no influence on overall visual quality. 0	Interesting within its setting, but fairly common within the region. 1	Modifications are so extensive that scenic qualities are mostly nullified or substantially reduced. -4

Scenic Quality

- A Scenery
- B Scenery
- C Scenery



Sensitivity Levels

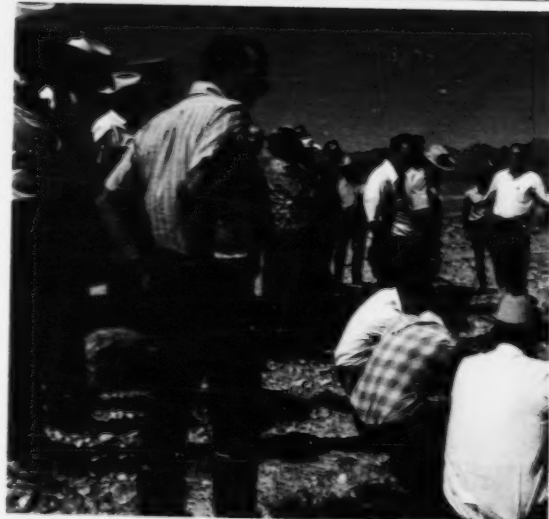
Although landscapes do have common elements that can be measured, there is obviously still a subjective dimension to landscape aesthetics. Each viewer brings perceptions formed by individual influences: culture, visual training, familiarity with local geography, personal values.

To measure regional and individual attitudes in the evaluation of a landscape, visual sensitivity is determined in two ways:

Use Volume Frequency of travel through an area (by road, trail, river) and use of that area (for recreation, camping, events) are tabulated. The area is then assigned a *high*, *medium*, or *low* rating according to predetermined classifications.

User or Public Reaction Public groups are familiarized with the area (if necessary) and asked to respond to activities that will modify that landscape. The concern they express about proposed changes in scenic quality is also rated *high*, *medium*, or *low*.

The various combinations of Use Volume and User Reaction for each area are rated by a matrix to an overall Sensitivity Rating of *high*, *medium*, or *low*. A map is then developed that illustrates final Sensitivity Levels.



Sensitivity Level Matrix

Sensitivity	High				Low				
User Attitude	H	H	M	H	L	M	M	L	L
Use Volume	H	M	H	L	H	M	L	M	L

User Attitude

High

Medium

Low

Use Volume

High

Medium

Low

Final Sensitivity

High

Medium

Low

Distance Zones

The visual quality of a landscape (and user reaction) may be magnified or diminished by the visibility of the landscape from major viewing routes and key observation points. In the VRM system, thus, distance plays a key part in visual quality management.

A landscape scene can be divided into three basic Distance Zones: **foreground/middleground**, **background**, and **seldom-seen**. Because areas that are closer have a greater effect on the observer, such areas require more attention than do areas that are farther away. Distance Zones allow this consideration of the proximity of the observer to the landscape.

Selection of the key viewing points and accurate assessment of Distance Zones require some judgment. Where several routes exist, what is foreground from one route may be background from another. (The more restrictive designation is used.) Atmospheric conditions may also modify the perception of distance.

For small projects, in-field photographic assessment of Distance Zones is usually sufficient. For large projects, however, or projects that require evaluation from many key viewpoints, an alternative method for generating data is to use a computer graphic modeling technique such as the VIEWIT system.

The process culminates in the preparation of a final Distance Zone map.



Distance Zones Example



Distance Zones

FG/MG	
BG	
SS	



Management Classes

Management Classes describe the different degrees of modification allowed to the basic elements of the landscape. Class designations are derived from an overlay technique that combines the maps of Scenic Quality, Sensitivity Levels and Distance Zones. The overlays are used to identify areas with similar combinations of factors. These areas are assigned to one of five Management Classes according to predetermined criteria. The resulting map of contiguous areas sharing the same VRM class is an important document for all Bureau land use planning decisions, and it is also used to assess the visual impact of proposed development.

Management Classes

- Class 1 
- Class 2 
- Class 3 
- Class 4 
- Class 5 

Visual Sensitivity	H			M			L
Special Areas	1	1	1	1	1	1	1
Scenic Quality	A	2	2	2	2	2	2
	B	2	3	3	3	4	4
	C	3	4	4	4	4	4
Distance Zones	FG MG	BG	SS	FG MG	BG	SS	SS

Note: Class 5 areas are those that have been identified in the VRM planning system which require rehabilitation or enhancement and therefore are not included in this chart.



Class 1

Natural ecological changes and very limited management activity are allowed. Any contrast created within the characteristic landscape must not attract attention. This classification is applied to wilderness areas, wild and scenic rivers, and other similar situations.



Class 2

Changes in some of the basic elements (form, line, color, texture, value) through management activity
Changes in some of the basic elements (form, line, color, texture, value) through management activity
Contrasts are seen, but must not attract attention



Class 3

Contrasts to the basic elements caused by a management activity are evident, but should remain subtle in the landscape.



Class 4

Any contrast attracts attention and is a dominant feature of the landscape in terms of scale, but it should repeat the form, line, color, and texture of the characteristic landscape.



Class 5

The classification is applied to areas where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the four other classifications. The classification also applies to areas where there is potential to increase the landscape's visual quality. It would, for example, be applied to areas where unacceptable cultural modification has lowered scenic quality; it is often used as an interim classification until objectives of another class can be reached.



Contrast Rating

To evaluate specific proposed projects, a Contrast Rating System is used to measure the degree of contrast between the proposed activity and the existing landscape. This score is compared with allowable levels of contrast for the appropriate Management Class. The comparison will determine if mitigation is required to reduce visual impacts.

The process first segregates a landscape into its major **features** (*land/water surface, vegetation, structures*) and each feature, in turn, into its basic **elements** (*form, line, color, texture*). Each element is assigned a weighted value based on its significance in the landscape (*form* = 4, most important, to *texture* = 1, least important).

The Contrast Rating compares the proposed activity with existing conditions element by element, feature by feature, according to the degree of **contrast** (3 = *strong*, 2 = *moderate*, 1 = *weak*, 0 = *none*). The element value multiplied by the degree of contrast indicates the magnitude of visual impact. For example, the *form* (4) of a proposed water tank might have a *moderate* (2) contrast with a flat landscape. Therefore, the *form* category of *land/water surfaces* would produce a Contrast Rating of 8 (4x2).

The Contrast Rating quickly reveals the existing features and their respective elements that will be subject to the greatest visual impact. A total contrast score for each feature may then be used to define the overall contrast according to the following general categories:

- Contrast can be seen but does not attract attention (0-10 points).
- Attracts attention and begins to dominate (11-20 points).
- Demands attention and will not be overlooked by the average observer (21-30 points).

This score is then compared to the appropriate Management Class to determine if contrast totals are acceptable. If the proposed project exceeds the allowable contrast, then a Bureau decision is made to (1) redesign, (2) abandon or reject, or (3) proceed, but with mitigation measures stipulated to reduce critical impacts.

Since each activity proposed for Bureau administered land must pass through this evaluation, it has proven useful to identify and mitigate extreme contrasts to scenic quality in the planning/design stage of a proposed activity prior to submittal for approval. This pre-evaluation can save time and money because it forestalls a potentially lengthy revision process.

Features	Elements/ Weights		Degree of Contrast		Score for Each Element
Land/ Water Surface	Form	4	Strong	3	
Vegetation	Line	3	Moderate	2	8
	Color	2	Weak	1	
Structure	Texture	1	None	0	
					Total

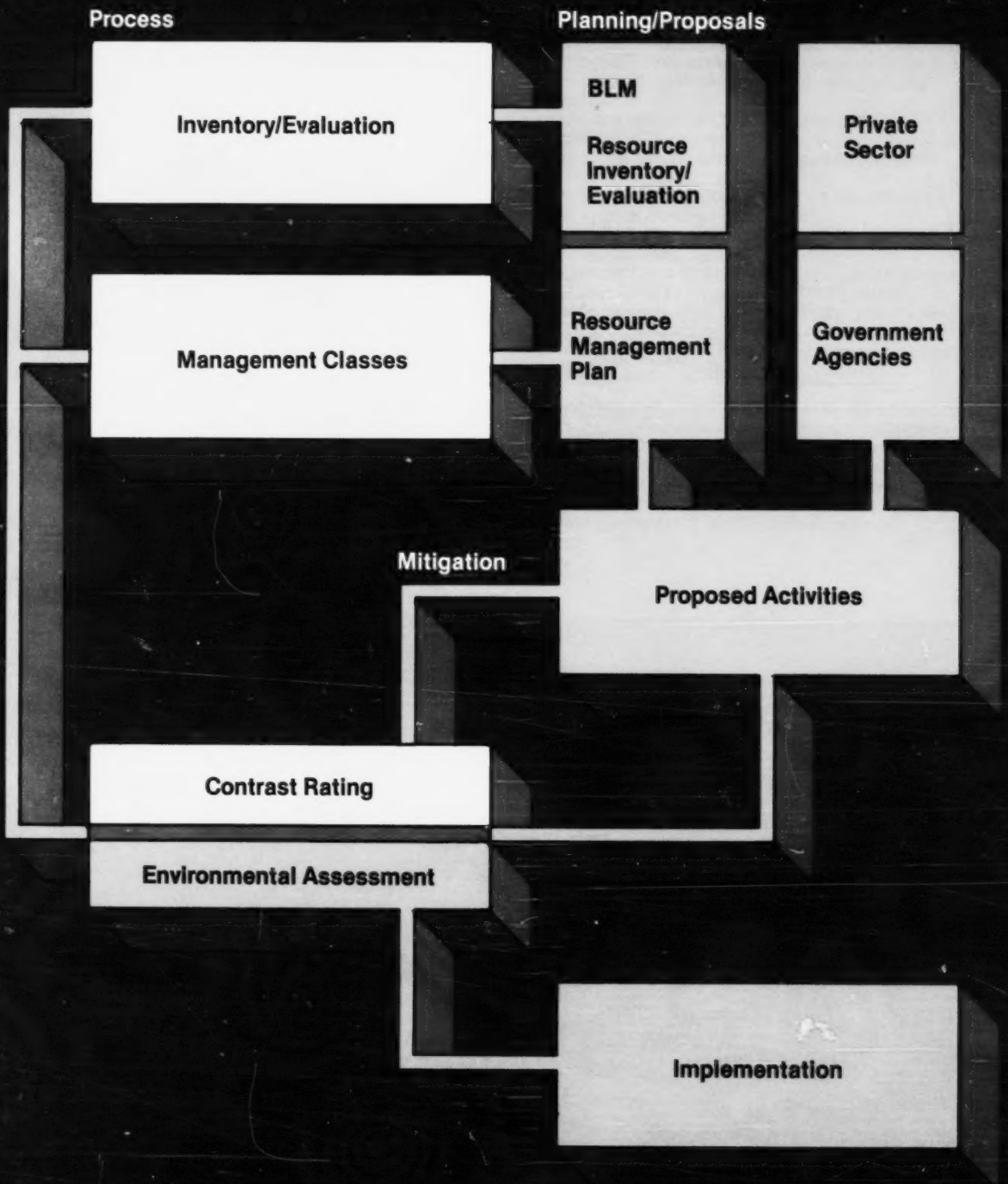
Proposed Site



Simulated Activity



Integration



Land Use Planning

Because there are such diverse factors affecting the management of public lands, proper planning is essential. The Bureau bases its management decisions on an extensive land use planning process.

This systematic process, which now includes careful consideration of visual resources, moves from the examination of existing conditions at a local scale through the formulation of cumulative land use plans and comprehensive decisions on a regional basis.

The basic building block of the Bureau's multiple-use planning is the Planning Unit. Resource inventory data, planning decisions, and other relevant facts are recorded for these units. A Planning Area contains one or more contiguous Planning Units. There are typically several Planning Areas in a District, and several Districts in a State. Each District is the responsibility of a District Manager who oversees planning, implementation and overall operation for each Planning Area.

As part of its planning process, the Bureau prepares numerous documents. These include documents which summarize Resource Inventory and Evaluation data, past planning decisions, and other relevant facts for the Planning Unit. They analyze the unit's potential to fill public needs for minerals, recreation, wildlife, forest, and rangeland.

In addition, another document uses socio-economic information to evaluate the present and future needs for land and for both renewable and non-renewable resources.

The Bureau then evolves its land use plan—the Resource Management Plan, which establishes land use allocations for Planning Areas, sets Bureau objectives for each resource and class of land use, and lays out guidelines for coordinating multiple uses.

The VRM process concurrently functions parallel with the overall planning process and interconnects at strategic points.

Resource Inventory and Evaluation draws on VRM for Scenic Quality analysis and the identification of enhancement, rehabilitation, or protection opportunities. It also provides essential background information for VRM's determination of visual Sensitivity Levels and Distance Zones. VRM Management Classes and recommendations are reviewed and incorporated into the final Resource Management Plan that sets specific resource activity objectives.

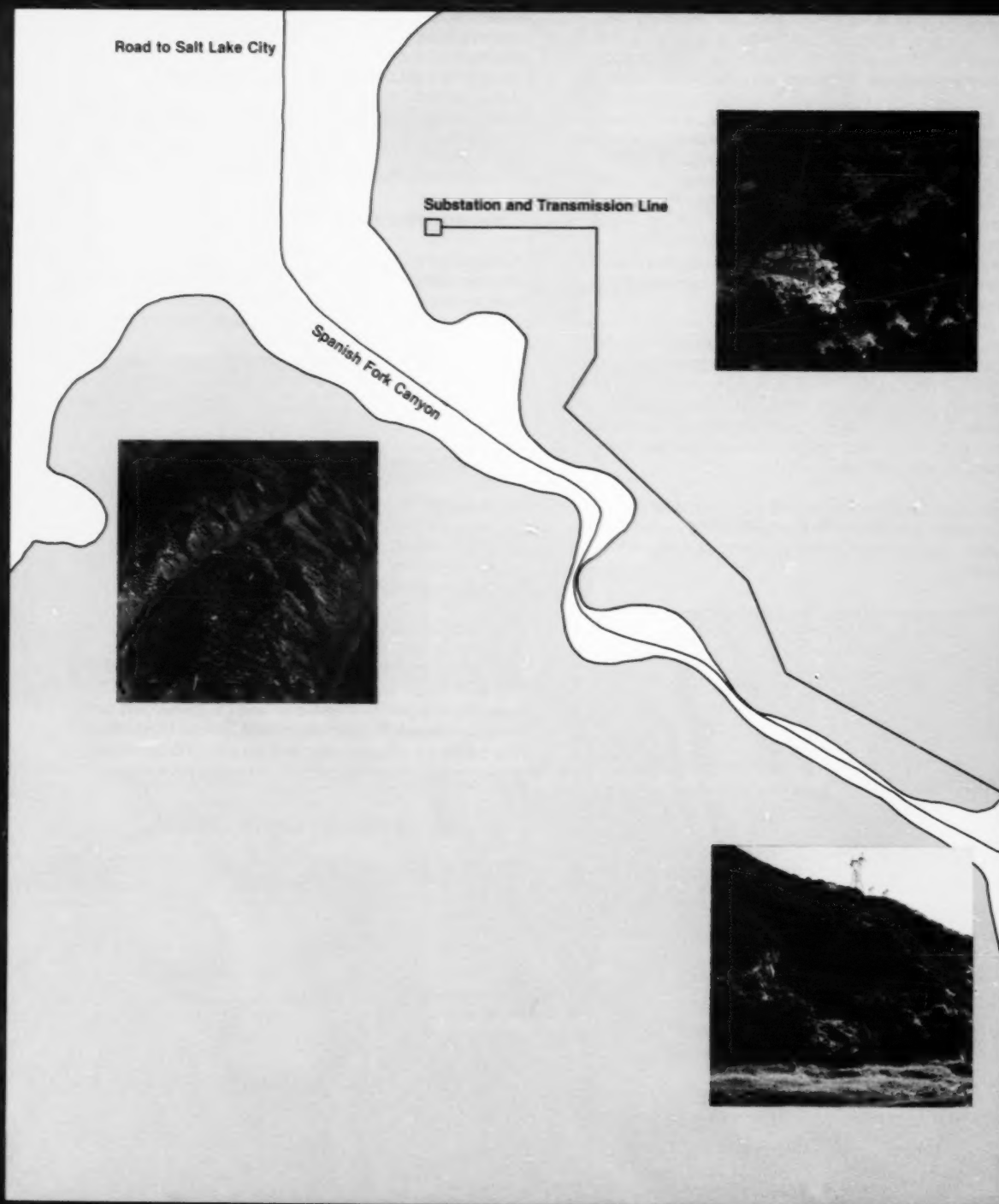
Environmental Assessment

Analysis of potential visual impact is required in all environmental assessments of projects proposed for Bureau lands. Although the depth of analysis may vary, it usually involves several steps directly related to VRM:

- Inclusion in the interdisciplinary team of design professionals such as architects, landscape architects, and land planners who have expertise in visual assessment.
- Description of the existing environment—including Scenic Quality, Sensitivity Levels, Distance Zones, and VRM Management Classes.
- Analysis of impact and proposed action, alternatives, and modifications—including recommendations for mitigating visual impact.
- Summary and conclusions—including VRM recommendations.

The Bureau uses the Contrast Rating System as its primary tool for analyzing the impact of proposed actions. If the Contrast Rating score does not meet the standards for the designated Management Class, specific mitigation measures will be developed and recommended. These recommendations then become the basis for stipulations written into the approved plan.

Application



VRM and Energy Development

Although the general outlines of VRM should now be clear, how VRM works in specific instances is perhaps less clear. Does VRM actually improve visual quality without obstructing the development of essential resources?

The answer is yes, as the following discussion of VRM and energy will demonstrate.

The United States consumes enormous quantities of energy—29 percent of the world's total—even though Americans make up only 5 percent of the world's population. Coal, natural gas, petroleum, hydroelectric stations, and nuclear plants supply most of this energy, although solar, wind, and geothermal energy sources are now put to increasing use.

Nearly all of these sources can be found on the 400 million acres of land administered by the Bureau. The development of these sources, already extensive, promises to increase and accelerate as our nation seeks energy self-sufficiency. As a result, showing how VRM can be applied to energy-related activities without reducing overall productivity offers perhaps the best single demonstration of the system's effectiveness.

Whatever the energy source or the technology used to turn it into power, energy development typically occurs in four stages: exploration, extraction, production, and transportation. The activities performed during each stage can seriously impact environmental quality in general—and visual quality in particular.

Controlling the visual impact of the numerous, massive, and utilitarian facilities required for energy development clearly presents a major challenge to the Bureau and its VRM system. But that challenge is being successfully met.

VRM at Work

The Utah Power and Light Company used VRM concepts in the location and design of a major transmission line. The result was not only mitigation of visual impact but also a demonstration of how proper planning can promote cooperation between a government agency and private industry—and how it can even save money.

Several years ago, the Utah Power and Light Company faced the task of constructing a new transmission line from a power plant at Huntington, Utah, to the Camp Williams substation (located south of Salt Lake City). This line would carry up to 600 Megawatts of electricity at 345,000 volts over many miles of rugged canyon lands and mountains. To support the line, transmission towers six to seven stories high would have to be built all along the transmission route.

Constructing the transmission line posed some real problems of potential visual impact.

A team of government specialists from the Bureau of Land Management and the United States Forest Service reviewed the transmission route proposed by Utah Power and Light. Putting VRM concepts to work, the team established Management Classes for the lands along the route and used the Contrast Rating System to evaluate the power company's proposal.

Certain areas, such as those located near a major recreation site, those easily visible from major roads, and those in highly scenic terrain such as Spanish Fork Canyon, presented cause for special concern—not only to the government agencies but also to people living near the proposed corridor.

After some negotiation of ways to mitigate the visual impact of the transmission line, Utah Power and Light revised its initial proposal. The company hired a landscape architect to develop visual simulations illustrating the mitigation measures it was prepared to undertake. The simulations were convincing, the mitigating measures acceptable, and what otherwise might have been serious problems of visual impact were expeditiously resolved during the project's design stage.

Visual Impacts

The visual impacts of the Huntington to Camp Williams transmission line, like those of most transmission lines, are caused essentially by the highly visible contrast between the man-made facilities and the natural elements of the surrounding landscape.

In the interests of safety, transmission lines carrying extremely high voltage must be strung well above the ground. The lines run between high towers built at intervals of 750 to 1000 feet. Although the shape of the towers can vary somewhat, they must be more than 100 feet high and made of strong, durable materials like aluminum or steel. The painted or galvanized surface of these metals contrasts strongly with the natural landscape, as do the towers themselves and the long transmission lines.

Preparing to construct a transmission line also creates problems of potentially severe visual impact. Access roads must be built for hauling in the structures and equipment needed to level tower sites and to string transmission line. Wide swathes of vegetation must sometimes be cleared along the transmission route. The construction process itself calls for staging areas and storage yards.

Clearly, construction of the Huntington/Camp Williams line involved contrast with the natural landscape in a number of stages. Clearly, too, evaluating varying levels of contrast was an essential first step, so that the government team and the power company could then negotiate acceptable levels of visual impact.

Exploration Specific exploration techniques vary with the energy source and the terrain. In general, however, the techniques include remote sensing, on-site mapping, site clearing, drilling, preliminary excavations, and the construction of retention ponds, access roads, and temporary facilities.

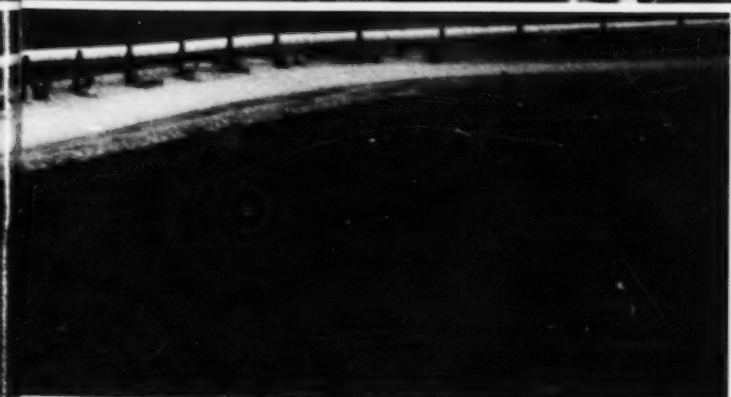


Production Producing energy calls for the construction of electrical generating plants, hydroelectric dams, pumping stations, petroleum tank farms, and many other major facilities. Solar facilities may use acres of solar reflector fields. Geothermal plants produce steam, coal plants produce smoke.





Extracting Techniques will vary. Extracting petroleum, for example, can require extensive well and pump facilities; extracting coal can require large strip-mine operations. Permanent structures are usually built during this phase as well. Because of overburden removal, coal storage in large piles, and construction activity for pipelines and maintenance roads, major modification of landforms often occurs.



Transportation Transporting energy from the often remote locations where it is produced to the consumer requires pipelines (for oil, gas, and coal slurry) or transmission lines. Construction of these facilities as well as the development of extensive maintenance and access roads to such facilities does impact the environment over long linear corridors running for hundreds of miles.

Mitigation Measures

Negotiation and consultation among representatives from Utah Power and Light, the Bureau of Land Management, and the Forest Service produced some specific mitigation measures acceptable to the agencies as well as the general public.

The towers along the Huntington/Camp Williams line were painted in varying colors of matte-finish pigments specially developed to blend with the dark natural landscape. The transmission line conductor was dulled at the factory or was painted on site to decrease its reflectivity and to lessen its visibility.

Where the line passed through areas of special scenic interest seen from roads or recreation sites, the towers were spaced at broad intervals of up to 1600 feet so that fewer towers were needed. Where the line moved across a mountain face readily visible to the public, it was placed high on the mountain, well above a lower existing line. Helicopters delivered towers and construction equipment to the mountain-side so that access roads did not have to be built, and vegetation was cleared only in the immediate vicinity of each tower site. Utah Power and Light used graphic simulations to pre-position towers and lines where they contrasted least with the landscape, screening them with trees, hiding them behind mountain ridges.

Proposed Activity



Results

The cooperative efforts of Utah Power and Light, the Bureau of Land Management, and the United States Forest Service were successful, both economically and aesthetically.

By using graphic simulation techniques to convey its proposals for the reduction of visual impact, Utah Power and Light was able to move through the approval process much more quickly than would otherwise have been possible. The result was considerable savings of time, which, for a company undertaking a large construction project, also means considerable savings in interest costs on money borrowed for construction.

By putting VRM to work, public agencies were able to present their requirements for the mitigation of visual impact in the objective terms of an integrated assessment system.

There have been, and will be, other examples of how VRM can be put to effective use. In the years to come, the continued application of VRM throughout the Bureau of Land Management should bring the Bureau and the public whom it serves ever closer to our national goal of continued productivity and the provision of aesthetically pleasing surroundings for all Americans.

Successful Modification



Bureau of Land Management

As the Nation's principal conservation agency, the U.S. Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

